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Dialogical Approach
in Virtual Communities:
Theories and Methods

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A method for the Analysis of Inter-action in an Online Learning Community

M. Antonietta Impedovo*, University of Bari

M. Beatrice Ligorio, University of Bari

Edmond H.F. Law, The Hong Kong Institute of Education

Abstract

In this paper we propose an innovative method, called Inter-Actions Network Analysis, to analyze discussions occurring via web-forums. The method has been tested on a blended university course about “Educational Psychology and E-Learning”. The theoretical background combines Activity Theory and Speech Analysis Theory. The method is composed by three steps through which a mix of qualitative discourse, content analysis, and quantitative analysis is performed. The first step provides a segmentation of notes in speech actions and the identification of the categories and sub-categories designed according to the Activity Theory, so to finalize a grid. In the second step the grid is applied and elicited and eliciting communicative actions are organized into a matrix. Finally, the third step investigates the network of the communicative actions through the Social Network Analysis. The method has been tested on a corpus of data consists of 72 notes posted by ten university students. This type of analysis allows deep understanding of the dynamic and the structure of the discussion and allows teachers and tutors to monitor and direct the discussion toward the predefined goals.

* Corresponding Author: Maria Antonietta Impedovo – University of Bari “Aldo Moro” – Department of Psychology and Pedagogical and Didactical Sciences – Piazza Umberto I, 1 – 70122 Bari (IT).

E-Mail: aimpedovo@gmail.com

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Online communities and interactions

Online communities are increasingly used in educational and professional contexts. The continuous improvement of new technologies allows a wide range of opportunities for online training and for creating learning communities (Brown & Campione, 1990), where technology acts as a mediator for knowledge building (Scardamalia & Bereiter, 2006). These online communities are also becoming common in higher education, supporting online and blended courses (Bonk & Graham, 2006). Online communication has great potential to support peer interaction because many of the constraints of face-to-face communication – such as the difficulty of managing students’ turn-taking, giving the floor to students who are usually silent, and keeping track of what it has been said (Swan, 2002) – are overcome. The literature shows that peer interaction and group activities are considered essential for supporting collaborative learning and for creating a learning community. Therefore, it is important to study the interactions developed in online communities in order to analyze, monitor and enhance their effectiveness and the achievement of educational goals (Philip, 2010). This type of research can be informative for researchers interested in designing better learning environments and more effective educational processes, and for teachers who want to investigate improvements in individual and group learning processes. Nevertheless, analyzing online interactions is particularly complex. Often, qualitative methods such as discourse and conversation analysis are used to understand the content of the communication (Sacks, Schegloff & Jefferson, 1974), whereas quantitative analysis is employed to check the frequencies of read, sent, and received messages (Rourke & Anderson, 2002). Qualitative methods allow a deep analysis of the communication but are very time-consuming. Quantitative methods facilitate large amounts of data to be analyzed, for instance, through automatic tracking, although this analysis does not reveal the dynamics that characterize online interactions.

The question of which methods are most appropriate to analyze online communities is still an open question, although many authors suggest a combination of methods as more effective in capturing the complexity of online interactions (Tashakkori & Creswell, 2007). We claim that the combination needs to be theoretically grounded, starting from the assumption that discussing online via web-forum has specific features.

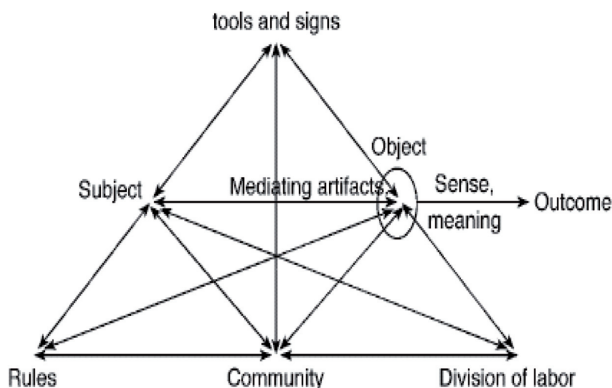
Pragmatic communication in online communities

Our theoretical starting point is pragmatism (Watzlavick, 1964) and we consider online interactions as containing all the different aspects of the interaction considered by this approach. These aspect are expressed through the 'typed text' and they refer to contextual, environmental and emotional features of both the online and offline contexts. The richness of the text typed online justifies the combination of two theoretical models: Activity Theory (AT) and Speech Analysis Theory (SAT). According to AT (Leont'ev, 1981), the social and cultural dimensions are central for the development of human psychological structures. Engeström (2001) made AT a powerful tool to analyze complex social systems, maintaining that activity systems are composed as follows:

- *Subject*, who participate in the activity with their personal characteristics;
- *Community*, which the person belongs to and for which the activity has a meaning;
- *Object*, individuals or groups are oriented to achieve their objectives;
- *Rules and Values*, that govern participation in a particular community;
- *Outcome*, that guides the actions of the participants;
- *Artifacts*, abstract and material tools and signs used to perform the activity;
- *Division of labor*, modalities of work considered relevant for the activity.

Graphically, the activity system is represented by the following triangle (see Fig. 1).

Fig. 1. Triangle of Activity System (Leont'ev, 1981)



Following the theoretical perspective of SAT, communication can be considered as a social activity, therefore we assume the AT categories could be coded within a discussion. Therefore, AT is combined with SAT, according to which meanings act in a pragmatic way and produce effects on social life (Austin, 1962; Searle, 1969). Discussing becomes an act, where the speakers reach certain goals by acting through words. The object of analysis is the everyday language, used to describe facts and to provoke events. Accordingly, we believe that performative speech acts should contain some or all the elements of AT (Outcome, Object, Tools and Signs, Subject, Community, Rules and Values, Division of labor). The presence, or conversely the absence, of these elements should shed light on the dynamics and content of the discussions.

Adopting a theoretical perspective that combines the AT with the SAT, we propose to observe and systematically track down categories extracted by these theories within online discussions.

Testing the method

Objectives

The objective of this paper is to test an innovative method we developed. The testing is performed on asynchronous, text-based web-

forum discussions. The forums are part of a virtual community in a blended learning course. The questions guiding our research are:

- 1) What categories and sub-categories defined by AT and SAT can be detected in a web-forum devoted to collaborative learning?
- 2) How are these categories distributed?
- 3) What can we learn from such a distribution?

The context and the participants

The context within which we tested the method is a complex blended course, described in details in the Introduction of this issue of *Qwerty*, where online activities are combined with face-to-face encounters. The course is on “Educational Psychology and E-Learning”, held at the University of Bari during the 2006/2007 academic year, attended by ten students (seven females and three males). Six modules covered the standard content of a course in e-learning and each module, lasting a week, was introduced by the teacher with a lesson held face-to-face, followed by discussion via web-forum. During each module, students in turn played different roles, specifically designed to support active participation (Ligorio & Cucchiara, 2011). For instance, students were required to act as e-tutors of the discussion; therefore, the student playing that role was entitled to start the discussion, to invite and encourage their peers to contribute and s/he made sure the discussion was focused on the theme proposed by the teacher. The platform used is called Synergeia and it is specifically designed for educational purposes (Ligorio & Veermans, 2005).

Our corpus of data is composed by the discussion entitled “Digital identity, telepresence, and emotional aspects of the network”, initiated by one of the students and composed of 72 notes.

The Inter-Actions Network Analysis

Considering the theoretical perspective we adopted and our goals, we elaborated a method we named Inter-Actions Analysis Network

methodology (I-ANA). We name this method deliberately introducing a dash between the word “inter” and “actions” to stress the connection with AT. Indeed, the categories composing I-ANA are designed based upon the elements theorized by AT.

I-ANA is able to manage the complexity of online interactions by combining quantitative and qualitative approaches. In particular, this method facilitates the study and description of how individual and groups act in the social activity of discussing and how the network of the discussion is structured. Our method is composed of three steps: 1) Identifying speech actions and AT categories; 2) Identifying elicited and eliciting communicative actions; and 3) Analyzing the network’s structure of communicative actions.

In the following sections, we will describe in detail each step, with instances of the analysis performed selected from our corpus of data.

First step: Identifying speech actions and AT categories

The first step in performing I-ANA requires identification of the AT categories within the discussion under investigation. To accomplish this step, we used discourse analysis (Goffman, 1981; Molder & Potter, 2004) for a holistic understanding of the processes of interaction, and content analysis (Ghiglione & Blanchet, 1991) to identify AT categories, with a specific focus on the content.

Specifically, this step has been implemented in two phases.

Phase 1: Each note was fragmented into “*speech actions*” or significant units of analysis having a recognizable communication aim. In Tab. 1 there is an example of how a note is segmented.

Tab 1. Example of Segmentation of a note using speech actions

Note title: “Digital Identity: From nicknames to emoticons”, posted by Igor (June 12, 2005)

I am starting this discussion as tutor... hoping I start it off on the right foot... ;-)	Segment 1
The topic is a easy one: We have to discuss about digital identity!!! How and why it is built? Which are the advantages and the risks of nicknames? And are emoticons useful in CMC?	Segment 2

In the example reported in Tab. 1, two communicative actions are recognizable into the same note: The first one is identifiable in the words “*I am starting this discussion as tutor ... hoping I start it off on the right foot*”. This is a unit of meaning with a specific communicative goal, which is to start the discussion. At the same time the author introduces himself and the role he is playing for the current module (the e-tutor). The following two lines have the communicative purpose of clarifying the topic of discussion. The strategy used by the student is to pose questions to stimulate his colleagues to discuss.

Phase 2: The second phase consists of coding. The notes already broken into speech actions are now categories using categories designed upon the AT elements. For this purpose, a grid called “GAct” was used (Spadaro, 2008). This grid (reported in Appendix A) consists of the AT elements considered as categories (Subject, Community, Object, Rule and Values, Outcome, Artifacts and Division of Labor. The last category was renamed Interaction because the division of labor was actually predisposed by the teacher and the students had only to execute the tasks as organized by the teachers. Such execution needed various forms of interaction – for instance, by sharing information – and through this category we aimed at understand the forms of interaction students used in order to execute the division of labor the teacher designed for them. Additionally, each category was composed of a set of sub-categories representing different ways in which the category may appear within an asynchronous web-forum discussion. For example, the category Subject could be expressed through the following sub-categories: Self-reference, Cognitive elements, Open identity, Internal identity, External identity, Embodiment, Role, and Belonging.

A total of 25 sub-categories were obtained. Sub-categories assigned to the category Subject are built upon the theory of Dialogical Self (Hermans, 1996) and the concept of positioning. Sub-categories concerning the Artifacts are based on Wartofsky’s (1979) ideas which distinguishes between primary artifacts and secondary artifacts. In this case, primary artifacts are the books or web links students share; whereas secondary artifacts are those concerning ideas and theories. An example of the application of the grid is represented in Tab. 2.

Tab. 2. Example of Application of the Grid “GAct”

Segment ID	Segment Text	Categories	Sub-categories
1.1.a	<i>I am starting this discussion</i>	Object	Topic
1.1.b	<i>As tutor...</i>	Subject	Role
1.1.c	<i>Hoping I starting it off with the right food ;-)</i>	Rule	Interaction
1.2.a	<i>This topic is easy one:</i>	Object	Topic
1.2.b	<i>We have to discuss about digital identity!!!</i>	Outcome	Process

Tab. 2 shows how a note decomposed into speech action can be further broken down into segments. To each segment it was assigned a Segment ID code composed of numbers and a letter: The first number indicates the note (in this example, the first note of the web-forum is being examined), the second number indicates the speech action (two speech actions have been identified in this note) and, finally, the letter indicates the segments of the action (here, the first communicative action has been split into three segments and the second action in two segments). To each segment is assigned one of the categories identified by AT: For example, the segment “*as tutor*” (1.1.b) is categorized as belonging to the category “Subject” because the writer describes himself and sub-category “Role” (in this case of e-tutor in reference to the role he is paying in the discussion).

The categories and sub-categories were attributed by two independent judges. An initial agreement of 80% was reached; the controversial cases were discussed and resolved achieving full agreement.

Distribution of Frequency of speech actions and AT categories

The procedure described above was applied to 72 notes posted in the web-forum described earlier. 124 speech actions were identified, with an average of 1.7 speech action per note. Furthermore, 454 segments were obtained, with an average of 3.7 segments for speech action.

Looking at the frequency of the categories it was found that the most frequent is Interaction (28.6%); followed by Object (23.1%), Community (15.6%), Subjects (13.9%), Artifacts (11%), Outcome (4.4%), and finally Rules and Values (3.3%). Subsequently, the frequency of the sub-categories were calculated. Tab. 3 shows an overview of the categories frequencies of each category and of the sub-category with the highest frequency.

Tab. 3. Frequency Analysis of the Categories and Sub- categories

Frequency of categories	Sub-categories with the highest frequency
Subjects (13.9%)	Self-reference (62%)
Community (15.6%)	You (38%)
Rules and values (3.3%)	Rules of work (87%)
Interaction (28.6%)	Development (61%)
Outcome (4.4%)	Process (60%)
Artifacts (11%)	Primary artifact (94%)
Object (23.1%)	Course topic (50%)

By reading the frequency distribution of categories and sub-categories reported into Tab. 3, it may be assumed that students mainly refer to themselves (Self-reference, 62%) with expression like “*In my opinion...*” and less to the others (You, 38%). Within the category Rules and Values there is frequent use of the Rules of work (87%), related to specific activities and to the organization of the discussion. The Ob-

ject of the discussion clearly refers to the Course topic (50%), talking about texts, materials and theories of the various authors relevant for the module.

Students pay attention to the Development (61%) and the Process (60%) of discussing. Particularly attention is paid to Primary artifacts (94%), for example “*I recommend this site...*”. Primary artifacts may be more familiar to students, whereas secondary artifacts – such as producing ideas or defining concepts – may need to be explicitly encouraged by the tutor or the teacher.

Second step: Identifying elicited and eliciting communicative actions

The second step of the I-ANA method aims to identify and finding concatenations between communicative actions by looking at what action elicits other actions and what actions are elicited by other actions. To track down such networks, for each communicative action we looked for the connected actions, that could be considered either as a consequence or as a stimulus for a new action. We considered *eliciting actions* those stimulating other actions – for instance, asking to provide a definition or to express opinions – defined as “senders”, and *elicited actions* – when the interlocutor clearly responds to a request or a stimuli previously posted – those appearing as consequence of other actions, defined as “receivers”. This type of analysis was performed by filling in a double entry table where the senders were reported in the horizontal lines and the receivers in the vertical lines. As for the inter-rater reliability, the coding was executed by two independent judges. The controversial cases (about 30%) were discussed and resolved until full agreement was reached.

Frequency of elicited and eliciting communicative actions

Tab. 4 shows the frequency of the eliciting and elicited actions within the notes we analyzed.

Tab 4. Frequency of Communicative Eliciting and Elicited Actions

Categories	Fr. Elicited		Fr. Eliciting	
	(f)	%	(f)	%
Subject	62	13.7	12	2.6
Community	71	15.7	9	2
Rule and Values	15	3.3	3	0,7
Interaction	130	28.7	65	14.3
Outcome	20	4.4	13	2.9
Artifacts	50	11	14	3.1
Object	105	23.2	25	5.5
No one	0	0	315	68.9
Total	453	100	453	100

Tab. 4 shows that the most frequently elicited actions are oriented to the task (Interaction 28.7%; Object 23.3%; Artifact 11%) and to individual or collective identity (Subject 13.7%; Community 15.7%). Unexpectedly, most of the actions are not elicited by any action (68.9%). This finding shows a particular dynamic concerning action elicited by one action but not eliciting, in turn, any communicative actions. A representative example is reported in Tab. 5. The notes here reported has only one segment – the one numbered 1.2.b – elicited by the segment 2.3.d; all the others segments are not eliciting and elicited by others.

Tab 5. Elicited and Eliciting Segment in a note

Segment	Segment Text	Dimension	Eliciting
1.2.b	We have to discuss about digital identity!!!	Outcome	1.1.a
1.2.c	How and why it is build? (...)	Interaction	nd
2.3.a	A paragraph	Artefact	nd
2.3.b	of my	Subject	nd
2.3.c	graduate thesis	Object	nd
2.3.d	Was just titled "Identity as dialogical construction"	Artefact	1.2.b

Third step: Analyzing the network of communicative actions

The last step analyzes the relationships between the content expressed during the online discussion. This implies the reconstruction of the network of elicited and eliciting communicative actions. During the first two steps we used a mainly qualitative approach. For the last step, we use a more quantitative approach through Social Network Analysis (SNA) (Scott, 1997; Wasserman & Faust 1994).

SNA is a quantitative, relational test based on the concepts of network, relationship and structure, and is particularly suited to finding out which individuals have more social relations within virtual communities. It focuses on the relationships between people and within organizations looking at the interdependence between individuals. SNA requires an adjacency matrix of exchanges occurring within a community (Reffay & Chanier, 2002). Based on this matrix, it is possible to understand the socio-relational dynamics and the evolution of the relations and reproduces the relational structure of the network with a graphical representation composed by nodes representing the individual actors and by lines connecting the points, depicting the relationships between nodes.

SNA uses various types of analyses to describe the features of the system through various structural indices. The indices used in our analysis are:

- *Density index* (or neighborhood analysis) useful for structure analysis of relationships in a network. It describes the level of cohesion between the nodes examined and the level of aggregation of the community. In our case, this index is useful to analyze the level of aggregation of the AT categories. It is represented by a value ranging between 0 and 1, where the greater value describes a configuration in which each node is connected with all the other nodes (Scott, 1997; Wasserman & Faust, 1994). The main indicator of this type of analysis is the inclusiveness index, that reveals the percentage of connections/relationships established within the network. The density index, instead, compares the aggregation level of groups in different interactional contexts and detects the lack of reciprocity during the discussion, identifying isolated nodes.

- *Centrality analysis index* is a specific measure of the role that a single node (representing a person or an entity as a category) has within the entire network. With this measure we can calculate the centrality of each node, but we can also estimate (with the sub-index called “Centralization index”) the entire network structure and show how a single node is central with respect to the most important points of the entire network.

The centrality analysis index can be measured through various indices that characterize specific groups or communities to which they belong. Among these, *betweenness centrality* (Freeman, 1979) expresses which node acts as mediator for other nodes.

The applications of SNA in the literature are wide, generally referring to the study of relationships between people. Recently, the diffusion of the SNA, mainly due to its potential to study online interactions, allows the use of the SNA to analyze groups that collaborate in a network to reach certain objectives or to acquire knowledge and skills (e.g., Aviv, Erlich, Ravid, & Geva, 2003; Mazzoni & Gaffuri, 2009; Refay & Chanier, 2002) and to examine the interactions in contexts devoted to knowledge building (Philip, 2010).

Unlike these applications, the method we developed is an innovative way to use the potential of the SNA for the analysis of eliciting and elicited communicative actions in a network: It provides a useful tool to observe empirically the interactional dynamics theorized from AT in a context of asynchronous web-forum discussion. In particular, density index allows us to observe how the various AT categories are distributed and represented in the discussion of web-forum; whereas the Centrality Analysis Index measures the role of each AT categories in the discussion.

Analysis of the network structure of communicative actions whit SNA

To perform the SNA we used the software Cyram NetMiner Software – version 3.3¹. This software offers the advantage of allowing an

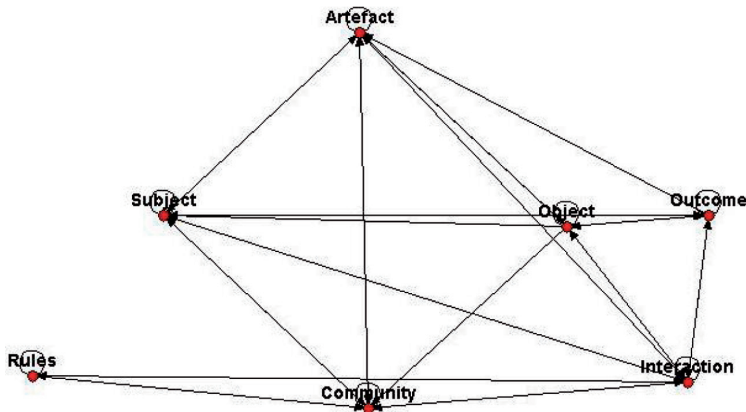
¹ www.netminer.com

easy data entry, transforming data into a graph which illustrates the network, performing all types of analysis, and producing a report file with descriptive and quantitative results. To use it, first the adjacency matrix of data should be imported into the software.

Additionally, an adjacency matrix has been prepared also for the analysis of sub-categories. The results obtained by applying the density index and centrality index to the categories are as follows:

- The overall *density index* between all categories is 0.61. Fig. 2 shows the resulting graph represented with an AT Triangle: No dimension is isolated (in fact, the Inclusiveness Index is 100%). The Interaction dimension has more links compared of other (with six elicited and eliciting links crossing the node): therefore, it mediates other dimensions.

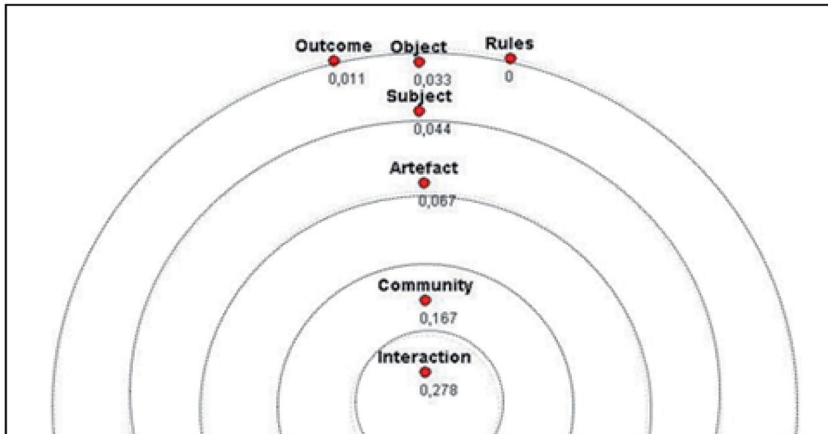
Fig. 2. Graphic Representation of the Dimension Obtained by the Density Index



The resulting network shows how each AT category contributes to the development of the discussion in our web-forum. However, some categories – such as Interaction – has more links to other categories, this allows to assume that they may play a more central role in generating chains of new communicative actions.

- The second Index used is the *betweenness centrality* that confirms the dimension of Interaction as central in relation to other categories, as shown in Fig. 3.

Fig. 3. Graphic representation obtained by the betweenness centrality²



In the betweenness centrality we calculated, furthermore, the value of centralization index: calculated on the overall network categories, it shows that 89.17% of the dimensions are elicited (OUT) compared to 22.58% (IN) that are eliciting. The value IN indicates the categories elicited, which has a percentage lower than the OUT value, indicating the categories elicited.

Both the two main indices above described (*density index* and *betweenness centrality*) show that Interaction is the best eliciting and elicited category: This shows that it is centrality in the network and the students' interest to manage the process of learning through individual process and shared knowledge. The application of the two indices was extended on the adjacent matrix of sub-categories. Processing and Re-processing are the sub-categories (both belonging

² We only report here half of the graphic to save space. Nevertheless all the relevant information is reported.

to Interaction) appearing to be the core themes emerging from the graph, reporting a high number of elicited and eliciting actions.

Finally, we analyzed the connections between the two sub-categories of Subject and Object as an example of how it is possible to reach a detailed understanding of a specific aspect of the discussion. The value of the density is very low (0.06): There are three separate sub-categories (External Identity, Role, Personal), with seven pending sub-categories (connected to other categories by a single link); five of them are self-elicited (Course topic, Internal identity, Common experiences, Cognitive uncertainty, Belonging) and the remaining are elicited by each other. Therefore, the pending sub-categories need to be sustained through specific action and attention.

Conclusion

This paper attempts to create a theoretically reliable and useful tool to analyze interactions in social activities with an aim to uncover layers of meanings embedded in socio-cultural contexts. At least two well established theories, AT and SAT, are involved; in addition social network analysis is used to recreate the structural pattern of the interactions. Data used in the paper include the analysis of the interactions among university students in a course about e-learning. Three observations are offered below. First, the newly created instrument I-ANA is a sophisticated one in the analysis of interactional data. However, it shows the inner structure of the interactions in relation to “who speaks what and why”. This should be very interesting since AT aims at uncovering the mediational effects of artifacts on the process of achieving outcomes while speech analysis shows us the functions of speech acts in contexts. Second, the distribution patterns, however, can also show us the domination of a particular type of discourse and its characteristics in the process of negotiation of meanings among the participants. Third, since the discourse is contextualized in an educational setting with a clear goal of achieving some specific form of learning, the interpretation of the interactional patterns shown in the social network analysis needs substantial inputs of educational theo-

ries to uncover the deep meanings of the recreated structural patterns of the interactions upon effective learning. Finally, I-ANA would be useful to analyze the interactions in collaborative learning situations and group work in schools to identify the key factors constraining or facilitating effective learning among students.

References

- Austin, J.L. (1962). How to do things with words. In A. Jaworski & N. Coupland (Eds.), *The Discourse Reader* (pp. 63-75). London: Routledge.
- Aviv, R., Erlich, Z., Ravid, G., & Geva, A. (2003). Network analysis of knowledge construction in asynchronous learning networks. *Journal of Asynchronous Learning Networks*, 7 (3), 1-23.
- Bonk, C.J., & Graham, C.R. (2006). *The Handbook of Blended Learning*. San Francisco (CA): Pfeiffer.
- Brown, A.L., & Campione, J. (1990). *Community of Learning and Thinking: Or a Context by Any Other Name*. New York (NY): Oxford University Press.
- Engeström, Y. (2001). Expansive learning at work: toward an activity theoretical reconceptualization. *Journal of Education and Work*, 14 (1), 133-156.
- Freeman, L.C. (1979). Centrality in social networks: conceptual clarification. *Social Networks*, 1 (3), 215-239.
- Ghiglione, R., & Blanchet, A. (1991). Analyse de contenu et contenus d'analyses. Paris: Dunod.
- Goffman, E. (1981). *Forms of Talk*. Philadelphia (PA): University of Pennsylvania Press.
- Hermans, H.J.M. (1996). Voicing the self: from information processing to dialogical interchange. *Psychological Bulletin*, 119, 31-50.
- Leont'ev, A.N. (1981). The problem of activity in psychology. In J. Wertsch (Ed.), *The Concept of Activity in Soviet Psychology* (pp. 37-71). Armonk (NY): Sharpe.
- Ligorio, M.B., & Cucchiara, S. (2011). Blended Collaborative Constructive Participation (BCCP): a model for teaching in higher education. *eLearningPapers*, 27th issue, available on: <http://www.elearningeuropa.info/it/node/111469>.
- Ligorio, M.B., & Veermans, M. (2005). Perspectives and patterns in developing and implementing international web-based Collaborative Learning Environments. *Computers & Education*, 45 (3), 271-275.

- Mazzoni, E., & Gaffuri, P. (2009). Monitoring activity in e-Learning: a quantitative model based on web tracking and Social Network Analysis. In A.A. Juan, T. Daradoumis, F. Xhafa, S. Caballe & J. Faulin (Eds.). *Monitoring and Assessment in Online Collaborative Environments: Emergent Computational Technologies for E-learning Support* (pp. 111-130). Hershey (PA): IGI Global.
- Molder, H., & Potter, J. (Eds.) (2004). *Talk and Cognition: Discourse, Mind and Social Interaction*. Cambridge: Cambridge University Press.
- Philip, N.D. (2010). Social network analysis to examine interaction patterns in knowledge building communities. *Canadian Journal of Learning and Technology*, 36 (1), 1-20.
- Reffay, C., & Chanier, T. (2002). Social network analysis used for modeling collaboration in distance learning groups. In S.A. Cerri, G. Guarderes & F. Paraguaco (Eds.). *Lecture Notes in Computer Science (LNCS)*, pp. 31-40, 2363.
- Rourke, L. & Anderson, T. (2002). Using peer team to lead online discussions. *Journal of Interactive Media in Education*, 1, 1-21.
- Sacks, H., Schegloff, E.A., & Jefferson, G. (1974). A simplest systematics for the organization of turn-taking for conversation. *Language*, 50, 696-735.
- Scardamalia, M., & Bereiter, C. (2006). Knowledge building: theory, pedagogy, and technology. In K. Sawyer (Ed.), *Cambridge: Handbook of the Learning Sciences* (pp. 97-118). New York (NY): Cambridge University Press.
- Scott, J. (1997). *Social Network Analysis. A Handbook*. London: Sage.
- Searle, J.R. (1969). *Speech Acts*. Cambridge: Cambridge University Press.
- Spadaro, P.F. (2008). Grid for activity analysis (GAct). In B.M. Varisco (Ed.), *Psychological, Pedagogical and Sociological Models for Learning and Assessment in Virtual Communities of Practice* (pp. 89-90). Monza: Polimetrika.
- Swan, K. (2002). Building learning communities in online courses: the importance of interaction. *Education, Communication & Information*, 2 (1), 23-49.
- Tashakkori, A., & Creswell, J. (2007). Exploring the nature of research questions in mixed methods research. *Journal of Mixed Methods Research*, 1 (3), 207-211.
- Wartofsky, M. (1979). *Models: Representation and the Scientific Understanding*. Dordrecht: Riedel.
- Wasserman, S., & Faust, K. (1994). *Social Network Analysis. Methods and Applications*. New York (NY): Cambridge University Press.
- Watzlawick, P. (1964). *An Anthology of Human Communication*. Palo Alto (CA): Science and Behaviour Books.

Appendix

GRID OF ANALYSIS OF CONTENTS

CATEGORIES	SUB-CATEGORIES	DESCRIPTION	EXAMPLES
1. Subject	Self-reference	References to own opinions or beliefs without reference to others	<i>I think that...</i>
	Cognitive elements	Uncertainties about personal opinions	<i>I do not know what to think</i>
	Open identity	Reference to uncertainties about their identity and/or future.	<i>I want become...</i>
	Internal identity	References to self emotions, aspect of personality.	<i>I'm skeptical</i>
	External identity	Indicates who accompanies you in shaping our identity	<i>My mother</i>
	Embodiment	Expressions that characterize you materially or that describe the physical context of writing	<i>I'm tall</i>
	Role	Reference to a specific task assigned.	<i>As a tutor...</i>
	Belonging	Reference of the subject that is part of a specific community.	<i>We have known it last year</i>
2. Community	You	Reference to a specific person in the forum	<i>I agree with you</i>
	Situated us	Reference to the group of participants in the forum	<i>Our Discussion</i>
	Generalized us	Reference to the general community (companies, generation, Italians, etc.)	<i>What gives us (society) is never enough...</i>
	External us	Reality or community shared by two or more participants to the forum.	<i>I'll see you in the university!</i>

	Embodiment us	Reference to the forum community through the use of metonymies (e. g, “talk”)	<i>I now start to enter the forum</i>
	Others involved	Reference to generic community in which the writers are involved	<i>The school can't afford to...</i>
	You	When the subject turns to the other participants of the forum, and is excluded	<i>You do not believe that</i>
3. Rules and Values	Moral and social rules	Are applied to a specific context and are fully justified	<i>... you should not take the place of books.</i>
	Rules of work	Discussion concerning the specific activities and organization of the forum	<i>Try to find theories or scientific studies to support your opinions</i>
4. Interaction	Individual development	Personal elaborations on the topics of discussion.	<i>I think the computer is a “magical” machine..</i>
	Reformulation and problematizations	Reformulation of the notes of others.	<i>According to you because you incite both the younger generation to use computers at school</i>
	Sharing of knowledge	Sharing personal experiences or emotions/ informal information.	<i>There are, for example, programs designed specifically for children with special difficulties</i>
	Highlight difference	Emphasize the differences among individuals or sub-groups in the forum.	<i>Some seem to refuse ... others, confident, praise...</i>
5. Outcome	Process	Explanation of the purpose of discussion, to “carry forward” the discussion	<i>But it would be interesting to understand...</i>
	Collective / individual product	Explanation of the purpose, i. e “doing the exam” or “write a final paper”	<i>I hope that this forum may open new avenues</i>

6. Artifacts	Primary artifacts	Sharing references / link, bring external expertise opinions.	<i>The use of PCs in kindergarten- I recommend this site...</i>
	Secondary artifacts	Construction of a “theory of the forum”, systematization of individual contributions in-unification	<i>About this specific topic has not come to a conclusion on which we all agreed, because...</i>
7. Object	Others	Reference to an object by a specific person of forum	<i>I agree with the thought of Mary</i>
	Personal	Regarding their experience	<i>In my works...</i>
	Course topic	Main topic in the discussion	<i>Dialogical Self theory...</i>
	Materials	Direct reference to teaching materials	<i>Articles in English where...</i>
	Common experiences	Experience that involves the participants in the forum	<i>... the teaching of human-machine interaction</i>
	Cognitive - relational	Implies that the reference to the emotional / cognitive experiences and relationships common	<i>There is no one remembers...</i>

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